



StirCradle™

Stirring Up Your Microbial Culture

The StirCradle™ System

Stirring Up Your Microbial Culture

Introduction

The StirCradle™ is a benchtop stirred tank bioreactor that can culture both microbial and mammalian suspension cell lines. It is a versatile system capable of supporting the growth of different cells including bacteria, yeast, plant cells, insect cells, and suspension mammalian cells. The system is available in three capacities with total volumes of 5 L, 7.5 L and 10 L.

Key Features

- Lightweight and small footprint vs similar competitor models
- Has Four (4) built-in peristaltic pumps which are configurable for automated fluid addition
- Has the optional 221 CFR Part 11 Compliance and can use optional SCADA system
- The patented design of the mixing system optimizes DO control during high density culturing
- Can run from different modes: batch, fed-batch, semi-continuous, continuous, and perfusion.
- Can be used with oxygen enrichment devices and/or multiple gas devices to achieve ideal gas mix for cell culture
- Vessel can be easily changed to suit different applications
- 10.4" TFT Full Color Touch Screen for Human-Machine Interface with easily replaceable panel membrane
- Able to save up to 20 customized culture settings (with 50 culture conditions each)
- Equipped with an easy-to-detach stainless steel condenser for easy cleaning

Applications

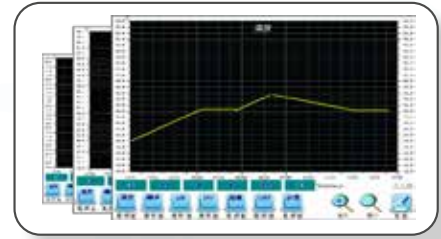
- Research and development
- Culture of bacteria, algae, yeast, and suspension cells
- Fermentation experiments and processes
- Laboratory-scale productions for academic and research and development purposes
- Batch, fed-batch, and continuous processes
- Seed production for pilot and production scale fermenters and bioreactors
- Food and beverage industry
- Secreted products



Other Features

Powerful Memory

- Real-time culture trend chart datalog
- Built-in continuous recording system of 12.5 (1 data every 30s), 25 days (1 data every minute) or 50 days (1 data every 2 minutes)
- Screen display can be zoomed in and out
- Easy transfer of data (in .xls format) through USB



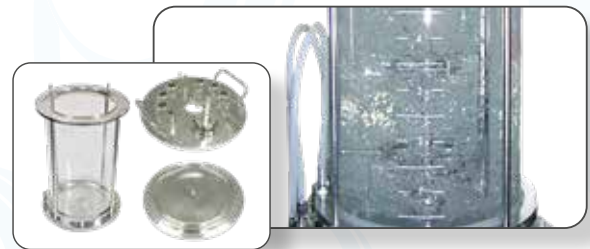
Touch Screen HMI with Adjustable Angle

- Can be adjusted to different angles according to operator position
- Creates comfortable working environment and increase space utilization



Guaranteed Quality, Safe, and Protected

- Tempered glass using PYREX (U.S) or SCHOTT (Germany)
- Rigid, heat-proof, acid-proof, alkali-proof
- Head plate and Bottom plate made of stainless steel 316, which underwent passivation, three manual mechanical polishing and EP (Electrolysis Polishing) on the surface ($Ra < 0.42 \mu m$).



Operating Data is Safe and Protected

- Eight distinct password protected levels of access (e.g. level 1 access can only view "Culture" window while level 8 access can modify parameters and settings)
- Secured company R&D or academic research data



User-friendly Interface

Culture Screen

- Real-time dynamic display and user-friendly icon control interface
- Shows the set and present values for each parameter and total accumulated liquid added from each pump
- Allows users to switch between automatic and manual control of parameters
- Shows the total culture time



Culture Screen

Parameter Setting Screen

- Users can input the set values and minimum and maximum values for the following parameters: pH, temperature, agitation, dissolved oxygen, and foaming
- Users can choose to have automatic or step control of the parameters:
 - Automatic: controlled by the set value (SV) of the user
 - Step: controlled by the step setting of the user
- Users can set one of the following DO control modes they require:
 - Agitation speed
 - Airflow (Requires optional massflow controller)
 - Agitation -> O₂ (Requires optional oxygen enrichment device)
 - Airflow -> O₂ (Requires optional massflow controller and optional oxygen enrichment device)
- Users can designate one of the following settings each peristaltic pumpsL
 - None: no pump action
 - Acid: acid additional
 - Alkl: alkali addition
 - Af: antifoam addition
 - Feed: feed addition
- Visual and audio alarms to indicate system errors



Parameter Setting Screen

Step Control Screen

- Users can set a 50-step control program for temperature, agitation, pH, DO, aeration, and feeding
- For each culture parameter, up to 20 programs may be saved and loaded
- Users can set the point within the 50-step program to begin with
- Step Control effectively achieves detailed segmentation control



Step Control Screen

Feeding Setting Screen

- Users can set the flow rate for each pump
- Users can set the pump to one of following:
 - On/Off: Users control pumping without depending on parameter values
 - DO Stat: Pumping is controlled by changes in DO value, depending on the criteria set by the user
 - pH Stat: Pumping is controlled by changes in pH value, depending on the criteria set by the user
 - If/Then: Allows more detailed control options for each pump. Pumping depends on the parameter condition set in the If/Then formula.



Feed Setting Screen

Two Configurations

StirCradle™ - Microbial Culture

StirCradle™ microbial culture is ideal for research and development for the culture of microorganisms, bacteria, fungi, or yeast.

ITEM	QUANTITY
StirCradle Control Tower	1 UNIT
Single-walled hollow vessel - Ring Sparger - Flat blade disk turbine propeller	1 PC
Heating Belt	1 PC
Exhaust Condenser with Tubing	1 PC
Servo Motor	1 PC
Benchtop pH Probe	1 PC
Benchtop DO Probe	1 PC
Benchtop Air Pump	1 PC
Benchtop pH and DO Cable + Transmitter	1 PK
Benchtop Anti-Foam Probe Include, cable, probe and transmitter	1 PK
PT100 Temperature Sensor	1 PC
Glass Bottle	4 PC
Glass Bottle Rack (SUS 304)	1 PC
Tool Pack	1 PC
Low Temperature Cooling Water Bath (Chiller)	1 PC
Silicon Tubing and Parts	1 PK
Sampling Bottle	1 PC
User Manual	1 PC
Two Gas (Air & O ₂) controller	1 PC

A variety of aeration strategies are suitable for:

- Aerobic culture
- Anaerobic culture

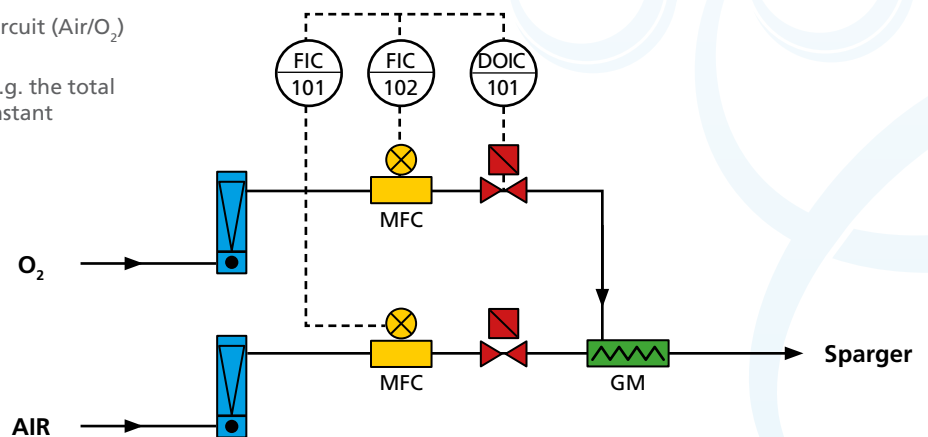
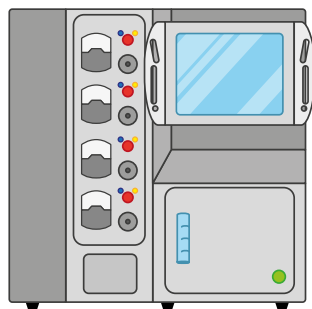
Available in 5 L, 7.5 L, and 10 L



Aeration Strategy

Gas Flow Ratio Control (GFRC) secondary circuit (Air/O₂) one outlet

The DO control can be adjusted to keep, e.g. the total flow rate or the ration of air to oxygen constant



StirCradle™ - Suspension Culture

StirCradle™ suspension culture configuration is ideal for bench-top research and development applications for the culture of insect cells and suspension mammalian cells.

A variety of aeration strategies are suitable for:

- Aerobic culture
- Anaerobic culture

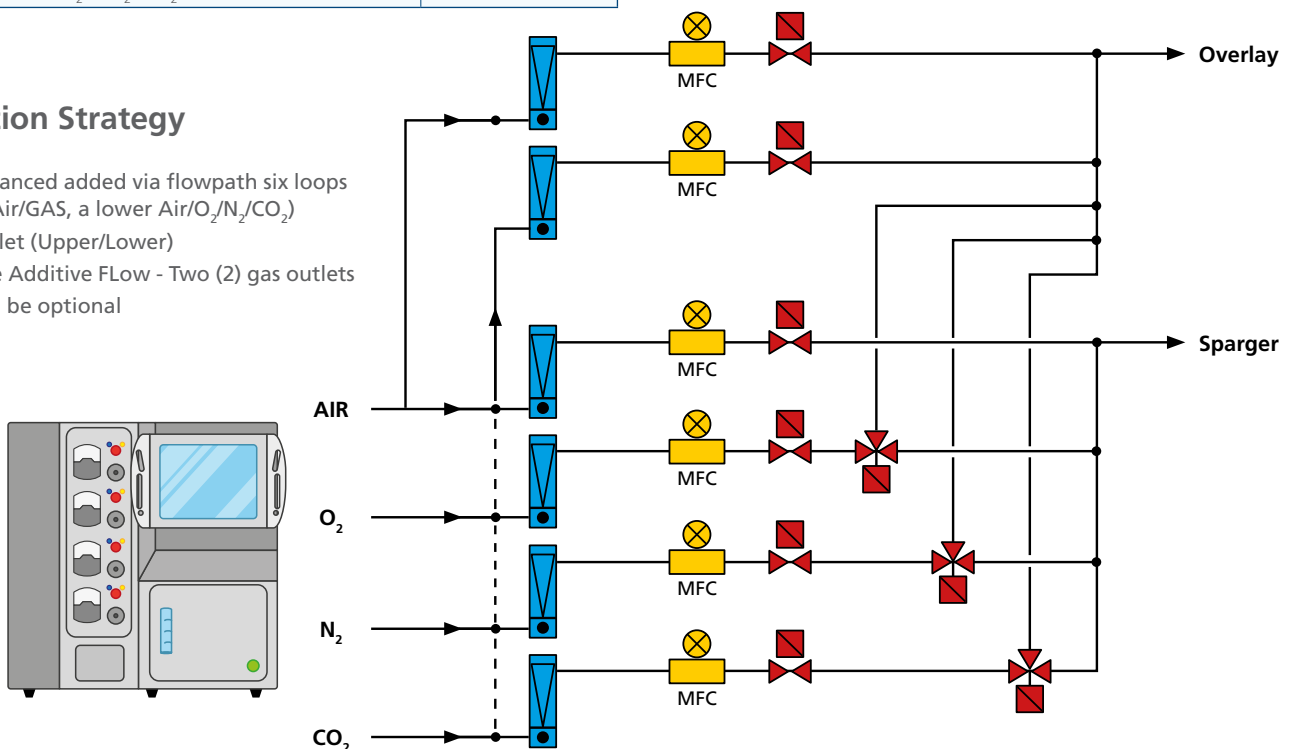
Available in 5 L, 7.5 L, and 10 L

ITEM	QUANTITY
StirCradle Control Tower	1 UNIT
Double Stainless Steel Jacketed Vessel - Ring Sparger - Rushton turbine propeller	1 PC
Heat belt	1 PC
Exhaust Condenser with Tubing	1 PC
Servo Motor	1 PC
Benchtop pH Probe	1 PC
Benchtop DO Probe	1 PC
Benchtop Air Pump	1 PC
Benchtop pH and DO Cable + Transmitter	1 PK
Benchtop Anti-Foam Probe Include, cable, probe and transmitter	1 PK
PT100 Temperature Sensor	1 PC
Glass Bottle	4 PC
Glass Bottle Rack (SUS 304)	1 PC
Tool Pack	1 PC
Low Temperature Cooling Water Bath (Chiller)	1 PC
Silicon Tubing and Parts	1 PK
Sampling Bottle	1 PC
User Manual	1 PC
Mass Flow Controller	4 PC
Four Gas (Air, O ₂ , CO ₂ & N ₂) controller	1 PC



Aeration Strategy

The Advanced added via flowpath six loops
(upper Air/GAS, a lower Air/O₂/N₂/CO₂)
Two outlet (Upper/Lower)
Advance Additive FLOW - Two (2) gas outlets
MFC can be optional



Vessel and Impeller Designs

In response to the increasingly complex special experimental needs, we provide a wide range of vessel design to speed up the cultivation process.

1. Quality and safety are guaranteed, durable and maintenance-free.

The tempered glass adopts PYREX, USA or SCHOTT, Germany advanced heat-resistant glass.

2. Fast & easy to clean

The headplate and bottom plate underwent passivation, mechanically polished thrice, and surface-treated through electrolysis at $RA < 0.42 \mu\text{m}$, and finally EP (Electrolytic Treatment) on the surface ($RA < 0.42 \mu\text{m}$)

3. Multiple impeller designs/ Anti-sticking coating is also available.

The patented downward suction dispersive stirring blade increases the retention time of dissolved oxygen and effectively increases the amount of dissolved oxygen in the culture vessel. With intelligent AI program-controlled setting of various culture parameters and impeller speed can be set at a minimum of 1 rpm, high density cultivation or delicate fermentation induction is possible to be done in this system. Especially suitable for the cultivation of lactic acid bacteria at low stirring speed after the initial resting and various high-density cultivation or delicate fermentation (secondary metabolites) induction.



Single-walled hollow vessel

- standard for microbial culture
- temperature culture through heating bottom plate

Material: Tempered glass: SUS 304



Double Stainless Steel Jacketed Vessel

- recommended for suspension mammalian cell culture
- temperature control through heating belt

Material: Vessel SUS 316 L; Jacket SUS 304 L



Double-walled Glass Jacketed Vessel

- favorable for mammalian suspension culture and protein production
- better temperature distribution

Material: Borosilicate Glass

Impeller Designs

Different microorganisms and cells require varying reactor flows to flourish and thrive in a stirred tank bioreactor or fermenter. A variety of impeller designs are available that result in different flow models.



Flat Disk Turbine



45° Flat Blade Disk Turbine



Curved Blade Disk Turbine



Pitched Blade Turbine



Curved Blade Turbine



Marine Propeller



Large Pitched Blade Impeller



Intermig



3-Segment Blade Impeller



Gate with Turbine



Max Blend



Helical Ribbon



General Specification

Overall Dimension (WxDxH)		Control Tower: 640 mm x 400 mm x 620 mm Control Tower w/ vessel: 980 mm x 400 mm x 750 mm		
Material		Vessel SUS 316 L ; Jacket SUS 304; Glass Borosilicate or tempered		
Control Tower	Memory	Continuous internal data logging up to 50 days (1 data saved every 2 minutes)		
	Interface	10" Colored Touch Screen HMI: Combination of TFT LCD display and a touch technology overlay screen		
	Features	Real-time dynamic display		
	Record Output	2 USB ports to save data to an external flash drive		
	Power Supply	220V Single Phase 7A		
Vessel features		StirCradle™ 5 L	StirCradle™ 7.5 L	StirCradle™ 10 L
Nominal Volume		5 L	7.5 L	10 L
Working Volume		1.3 – 4 L	2 – 6 L	2.5 – 8 L
Tank Nominal Height		9 kg	10.5 kg	11.5 kg
Maximum Height (with condenser)		460 mm	540 mm	570 mm
Maximum Outer Diameter		196 mm	220 mm	245 mm
Agitation	Drive	Small AC servo motor with automatic feedback compensation capable of low speed, high torque		
	Sensor	Optical coupler code, 1000 Hz		
	Range	1 -1200 rpm		
	Precision	1 rpm		
	Impeller	2 x Rushton Turbine Impeller		
Baffles		Inclusive in Fermentation Standard Vessel		
Temperature	Range	Cooling Water: +5 °C to 80 °C External cooling system: +4 °C to 80 °C Rapid Temperature Change: 1 °C/min (25-45 °C)		
	Precision	±0.01		
	Sensor	PT 100		
	Control	Heating Pad		
pH	Range	Detection range: 0-14; Control range: 2-12		
	Precision	±0.01		
	Probe	Mettler Toledo/Ingold Type or Hamilton Type		
	Control	Fermentation: Acid/Alkali Addition Cell Culture: CO ₂ /Alkali Addition		
DO	Range	Display Range: 0-200% Setting Range: 0-100%		
	Precision	±0.01%		
	Control	Gas Injection through Sparger		
Aeration	Airflow	0-10 nL/min		
	Filter	0.2µm PTFE filter		
	Delivery	Ring Sparger or Microsparger		
	Optional	Oxygen Enrichment Device Second Gas Port (O ₂ , N ₂ , CO ₂ or other gases)		
Mass Flow Controller	Microbial culture	2 MFC		
	Suspension culture	4 MFC		
Oxygen Transfer Rate		350 mM O ₂ L/hr or higher (fermentation application data)		
Condenser	Filter	0.2 µm PTFE filter		
	Condenser	Stainless Steel Condenser		
Peristaltic Pumps	Number	4 built-in, configurable peristaltic pumps		
	Configurations	Akali, Acid, Feed, Antifoam		
	Additional	Up to 3 external peristaltic pumps		
	Tube Sizes	4 types (ID: 0.8, 1.6, 3.2, or 4.8 mm)		
	Speed	6.5-65 rpm		
	Flowrate	2.5-106 ml/min		

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